

### 4.3 Three Pulse Converter

#### INTRODUCTION TO 3-PHASE CONTROLLED RECTIFIERS

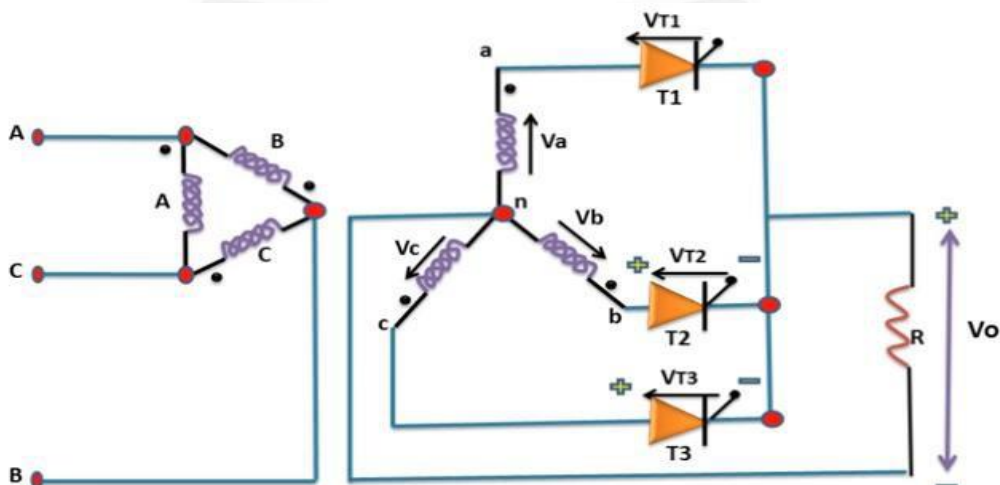
Three phase converters are 3-phase controlled rectifiers which are used to convert ac input power supply into dc output power across the load.

#### FEATURES OF 3-PHASE CONTROLLED RECTIFIERS ARE

- ❖ Operate from 3 phase ac supply voltage.
- ❖ They provide higher dc output voltage and higher dc output power.
- ❖ Higher output voltage ripple frequency.
- ❖ Filtering requirements are simplified for smoothing out load voltage and load current. Three phase controlled rectifiers are extensively used in high power variable speed industrial dc drives.

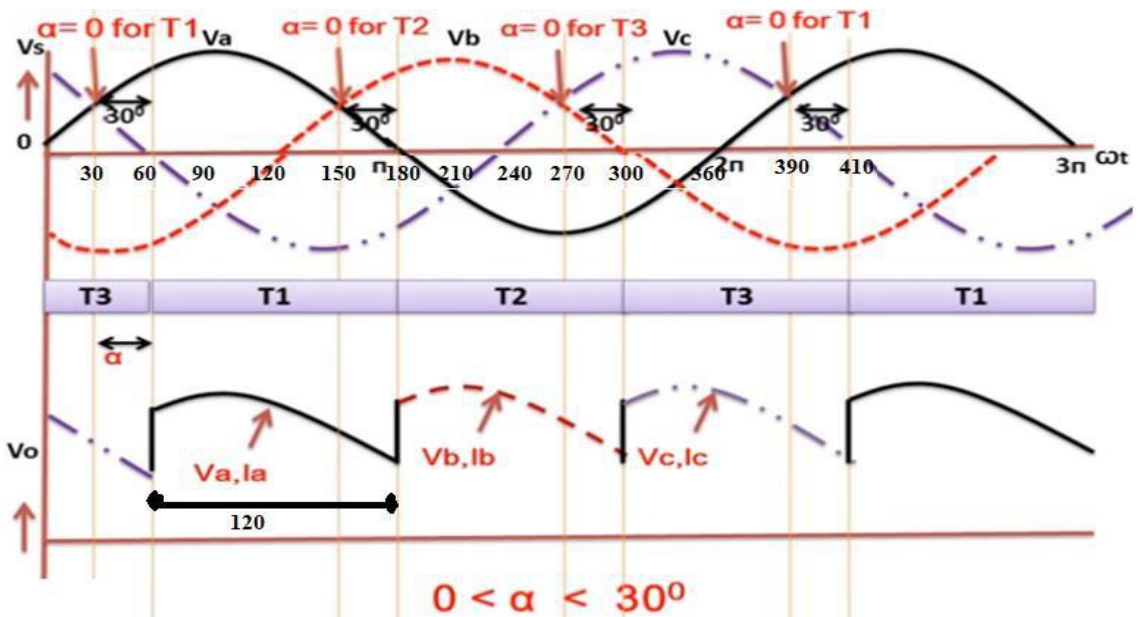
#### 3-PHASE HALF WAVE CONVERTER WITH R LOAD (Three Pulse Converter)

Three single phase half-wave converters are connected together to form a three phase half-wave converter as shown in the figure.



**Figure 4.3.1 Three pulse converter circuit diagram**

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 214]



**Figure 4.3.2 Three pulse converter Waveforms**

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 11]

The 3-phase half wave converter combines three single phase half wave controlled rectifiers in one single circuit feeding a common load. The thyristor T1 in series with one of the supply phase windings ' a - n ' acts as one half wave controlled rectifier. The second thyristor T2 in series with the supply phase winding, 'b - n ' acts as the second half wave controlled rectifier. The third thyristor T3 rectifier in series with the supply phase winding ' c - n ' acts as the third half wave controlled.

The 3-phase input supply is applied through the star connected supply transformer as shown in the figure. The common neutral point of the supply is connected to one end of the load while the other end of the load connected to the common cathode point. When the thyristor T 1 is triggered the load current flows through the supply phase winding 'a - n ' and through thyristor T1 as long as T1 conducts.

When thyristor  $T_2$  is conducts the phase voltage  $V_{bn}$  appears across the load until the thyristor  $T_3$  is triggered . When the thyristor  $T_3$  is triggered the phase voltage  $V_{cn}$  appears across the load.

For a purely resistive load where the load inductance ' $L = 0$ ' and the current appears as discontinuous.

The frequency of output ripple frequency for a 3-phase half wave converter is  $3f_s$  , where  $f_s$  is the input supply frequency.

The 3-phase half wave converter is not normally used in practical converter systems because of the disadvantage that the supply current waveforms contain dc components.

